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Semi-annual earnings announcements and market reaction: some recent findings for a small capital market

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ABSTRACT

This paper tries, first, to document the returns response of stocks to unexpected semi-annual earnings after the announcement of these earnings in a small capital market, i.e. the Brussels Stock Exchange (hereafter BSE), and second, to assess the explanations and empirical problems found in the literature concerning the post-earnings announcement drift. The motivation for this research is the introduction of new Belgian legislation initiating the reporting of the semi-annual results of the firms listed on the BSE (Royal Decree of 18 September 1990). We also attempt to avoid potential empirical problems of earlier Belgian studies and use some techniques more comparable with those of recent American studies. The results show that systematic post-earnings announcement drift is found neither for the market mode, nor for the size-adjusted returns model. The results also suggest that the market model is not a descriptively valid pricing model for the BSE or that its parameters are misspecified. When we distinguish between large and small firms, we discover for the size-adjusted returns model a *CAR* pattern for the large firms consistent with the results reported in the literature. However, the small firms show a puzzling pattern.

INTRODUCTION

Over the years a number of papers have appeared which analysed the issue of market efficiency with respect to earning reports, i.e. looking whether the market is able to fully digest available earnings information. Ball and Brown (1968) discovered that even after earnings are announced, estimated cumulative abnormal returns continue to drift up for 'good unexpected news' firms and down for 'bad unexpected news' firms. Many other authors reported similar results, e.g. Bernard and Thomas (1989) estimated that a long position in the highest unexpected earning decile and a short position in the lowest decile leads to a cumulative abnormal return of approximately

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4.2% over the sixty days subsequent to the announcement, or about 18% on an annualized basis. The apparently lagged reaction to earnings information is referred to as the post-earnings announcement drift, hereafter PAD.[1] This paper has two basic purposes. First, to document precisely the returns response of stocks to unexpected semi-annual earnings after the announcement of these earnings in the Brussels Stock Exchange (hereafter BSE). Second, this study gives some explanations for the empirical findings.

The remainder of the paper is organized as follows. The next section discusses the motivation for doing this empirical research in Belgium. The variables 'unexpected semi-annual earnings' and 'abnormal daily returns' are explained in the third and fourth sections. The fifth section describes the population and the sample. The sixth section describes the hypotheses and the statistical techniques. The results and interpretation are presented in the seventh section. Finally, the last section provides a summary and offers some concluding remarks.

MOTIVATIONAL BACKGROUND

The former American results are in contrast with these of several Belgian studies (e.g. Beghin, 1983; Hawawini and Michel, 1983). The latter show that the BSE is semi-strong efficient and that it is therefore impossible to earn abnormal returns on the basis of the information incorporated in the (annual) earnings announcement. Is the BSE an exception or are the market efficiency findings due to the techniques used in the earlier Belgian studies? In this study we attempt to avoid the potential empirical problems of these earlier Belgian studies and use techniques more comparable with those of the recent American studies.

Another important motivation for this research is the introduction of new legislation concerning the reporting of the semi-annual results of the firms listed on the BSE (Royal Decree of 18 September 1990). The application of this new 'financial information' law started in the fiscal year 1991. Therefore it is now possible to test the semi-annual earnings for post-earnings announcement drift, in contrast with the previous Belgian studies which always used annual earnings. The main research question is whether the new law has a direct effect on the investor, so that all released information is directly incorporated in the stock prices: does knowledge of previous semi-annual earnings information have predictive power for abnormal returns around subsequent earnings announcements?

UNEXPECTED EARNINGS

The first part of the earnings announcement-return relationship concerns the calculation of the unexpected earnings. The next section describes a simple earnings-based expectation model to predict future semi-annual earnings.

Earnings based expectation model (EBM-Model)

This model considers unexpected earnings as the forecast error of semi-annual earnings:

$$SUE_{i,t,s} = \frac{EPS_{i,t,s} - E(EPS_{i,t,s})}{MV_{i,t,s}} \tag{1}$$

where $SUE_{i,t,s}$ is the unexpected earnings of firm i in year t and semester s, where s equals 1 or 2; $EPS_{i,t,s}$ is earnings per share of firm i in year t and semester s; $E(EPS_{i,t,s})$ is the forecasted earnings per share of firm i in year t and semester s; and $MV_{i,t,s}$ is the logarithm of the market value of firm i at the end semester s in year t.[2]

Because the investors' expectations cannot be observed directly, we use a prediction model to estimate these expectations. Two types of expectation models can be defined: statistical and financial analysts based model. In this study we assume that semi-annual earnings follow a random walk, i.e. they can be modelled by a naive (statistical) forecast model which takes the previous year semi-annual earnings as predictors for the current earnings:

$$E(EPS_{i,t,s}) = EPS_{i,t-1,s} \tag{2}$$

It is not possible to calculate the trend over more years because of the lack of consistent time series of consolidated semi-annual earnings. For the semi-annual earnings forecasts in 1991 (the year with the first mandatory disclosure) we use semi-annual data of the previous year when these already existed in 1990; in the case where no semi-annual earnings were reported, we use half of the annual earnings as predictors.

Portfolio assignment

The unexpected earnings are used to assign the firms of the sample to one of five portfolios. For each examined year, all firms are ranked based on their standardized unexpected earnings. The quintiles of the distribution of each year are then used as cut-offs for assigning firms into one of the five portfolios. Because of the potential danger of a hindsight bias that tends to magnify the drift, the assignments may not be based on the ranking of unexpected earnings of all firms, including those which have not yet announced for the current semester. Therefore firms are assigned to their portfolios on the basis of their unexpected semi-annual earnings of the prior semester.

As appears from the portfolio assignment, we measure the reaction of security prices to the size of unexpected earnings and not to the sign of unexpected earnings as in the former Belgian studies. However, a preliminary analysis of the different portfolios shows that portfolio 1 only consists of negative standardized unexpected earnings, while the standardized unexpected earnings of portfolio 5 are all positive.

ABNORMAL DAILY RETURNS

In the current type of event study, it is essential to study precisely the behaviour of the security prices around the time of the event (the earnings announcement). A crucial question is whether it is possible to earn cumulative abnormal returns. The abnormal daily return is the difference between the actual daily return and a benchmark or normal (expected) daily return. First we will discuss the measure of the actual daily return. Methods to estimate normal daily returns will be presented in a second part. Finally, we will pay some attention to the concept of cumulative abnormal return.

The actual daily return

We need daily returns for the period 1990–1993. The actual daily return is computed using closing prices:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1} + D_{i,t}}{P_{i,t-1}} \tag{3}$$

where $R_{i,t}$ is the actual daily return of firm i on day t; P_t (P_{t-1}) is the closing price of the security on day t (day $t-1$) and $D_{i,t}$ is the dividend of firm i paid in period $[t-1, t]$. Blume and Stambaugh (1983) show that, because of bid-ask bias, the closing price can differ from the true price.[3] In the BSE the spread does not show up as a potential problem because there are no market makers, and thus there are only real transaction prices.

The normal (expected) daily return

We will define two models to estimate expected daily returns: the market and risk adjusted returns model and the size adjusted returns model.

Market and risk adjusted returns model

The most popular model used by Belgian financial analysts to calculate expected returns is the market model (Sharpe 1964):

$$E(R_{i,t}) = a_i + b_i R_{m,t} \tag{4}$$

where $E(R_{i,t})$ is the expected daily return of firm i on day t; a and b are OLS estimators;[4] and $R_{m,t}$ is the realized, equally weighted market return on day t (based on the whole market, i.e. 180 stocks).

Size adjusted returns model (Foster et al., *1984; hereafter FOS)*

The problem with the previous model is the danger of parameter mis-specifications: the assumed stationarity of the β, thin trading problem, the bias introduced by the period examined, intervalling effect bias, etc, (see Draper and Paudyal, 1993 for a discussion). The size adjusted returns model avoids problems related with the estimation of the market beta, but cannot solve the thin trading problem. Another benefit of this method is that it controls for the firm size effects in security returns first mentioned by Banz (1981) and Reinganum (1981). First, we rank all firms at the start of each year and separate them into two categories: 'large firms' and 'small firms'. Firm size is measured by the market value of common stocks. Then we compute the equally weighted main daily return of the group 'large firms' and the group 'small firms' for the next 12 months. According to this model, the daily expected return of firm i in day t equals the mean return for day t of the firm size group (large or small firms) firm i belongs to the beginning of the calendar year.

Cumulative abnormal returns

Usually, abnormal returns of the portfolios are cumulated by using the arithmetic form:

$$CAR_T = \frac{1}{N}\sum_{i=1}^{N}\sum_{t=1}^{T} AR_{i,t} \qquad (5)$$

where T is length of the cumulative period (in days) and N is the number of stocks in the portfolio. We will cumulate abnormal returns for the period ending one day (T=2), thirty days (T=30), sixty days (T=60) and ninety days (T=90) after the earnings announcement, and also the period starting sixty days (T=59) before the earnings announcement and ending one day before, and the period starting one day before (T=3) and ending one day after the announcement. The last two periods provide evidence on the accuracy of announcement dates and of the expectation benchmark.

POPULATION AND SAMPLE

The total population of this study consists of Belgian firms which are listed on the Brussels Spot Market during the period [Jan. 1990, Dec. 1993]. In order to select the firms, the following sampling criteria are used:

1) *trading volume*: Because of the thin trading problem on the BSE, only the most actively traded companies are considered. Thin trading may cause misspecification of the parameters of the market model (Scholes and Williams, 1977; Dimson, 1979; Fowler and Rorke, 1983), but the proposed adjustments seem to be ineffective on a small capital market (Bartholdy and Riding, 1994).
2) *semi-annual earnings reporting*: The sample companies should report semi-annual earnings and no quarterly earnings.

3) *end-of-year*: Firms with a non-december fiscal year-end are excluded. By doing so, the earnings announcements are concentrated in the same period and the daily returns of all securities are biased in the same way by the year-end-effects.[5] By using this criterion we introduce the potential problem of cross-sectional correlation in abnormal returns.

The final sample contains 30 firms (cfr. Table 1) and represents 72% of the total market capitalization in 1991. In 1991 and 1993 the sample contains only 29 firms. In 1991 it was not possible to find a semi-annual earnings announcement for the firm Powerfin and in 1993 the stock of the firm Mercantile Beliard was not traded after the semi-annual announcement of the firm. There is a great diversity in firm size (the smallest market value in 1993

Table 1 Sample firms

		Market value in billion Belgian francs		
	CODE	*1991*	*1992*	*1993*
1. Ackermans	AVHO	7.80	7.90	11.35
2. Axa (former Drouot)	AXA	5.90	5.90	7.94
3. Barco	BARC	9.40	13.00	22.16
4. Bekaert	BEKA	20.40	29.60	46.58
5. CBR	CBR	29.30	35.80	53.49
6. CMB	CMBG	17.20	14.10	21.85
7. Cobepa	COBP	41.30	36.20	48.95
8. Crédit Général	CG	4.60	5.70	8.27
9. Deceuninck	DCPL	5.90	7.10	9.61
10. D'Ieteren	DIET	10.20	8.70	7.09
11. Electrabel	EBEL	245.30	304.40	362.98
12. Electrafina	EFNA	66.80	53.60	82.48
13. GBL	GBL	73.00	62.10	90.04
14. Gechem (former Recticel)	GCH	5.00	8.60	12.40
15. Generale Bank	SGBQ	85.70	101.00	131.49
16. Generale Maatschappij van België	SGB	105.70	110.30	169.87
17. Gevaert	GEVT	27.30	26.90	37.81
18. Glaverbel	GLAV	14.50	10.70	15.02
19. Immobel	IMMO	11.50	10.60	14.34
20. Mercantile Beliard	MERC	0.69	4.53	7.70
21. Nationale Portefeuillemaatschappij	CNPO	43.40	37.80	46.42
22. Petrofina	PETR	250.50	174.60	228.78
23. Powerfin	PWFU	60.90	60.80	84.28
24. Royale Belge	RBVA	60.40	64.70	91.52
25. Sofina	SFNA	21.30	18.80	27.39
26. Solvay	SOLA	96.90	94.30	121.47
27. Tractebel	TRAC	107.90	106.60	147.83
28. UCB	UCB	27.10	32.50	37.04
29. Union Minière	ACEC	53.00	52.40	60.32
30. Wagons-Lit	WLOR	35.90	26.10	25.72

is 7 million and the largest is 363 million BEF, see Table 1), such that the use of a size-adjusted return model for expected returns makes sense.

Before discussing the testable hypotheses and the results of our empirical research, we give a brief review of the explanations in the literature concerning post-earnings announcement drift.

STATISTICAL TESTS AND RESEARCH TOPICS

The *CAR*-results (defined earlier) can only be interpreted after examination of the statistical significance of these results. We will use a statistical resampling procedure, called the bootstrap, to compute the *p*-values. We calculate cumulative abnormal returns for six subperiods: [−60,−2], [−1,+1], [+1,+5], [+1,+30], [+1,+60] and [+1, +90], with day 0 the day of the earnings announcement. We use an earnings-based model to assign firms to portfolios and two different ways to calculate the abnormal return, i.e. the market model and the size-adjusted model (each having six subperiods). We also check the dataset for possible outliers.

We will first test whether the mean of each of the five *SUE*-portfolios is significantly different from zero (i.e. a one-sample problem). Instead of using a *p*-value obtained from the *t*-distribution, we calculate an *achieved significance level* (hereafter *ASL*) based on the following bootstrap resampling procedure (Efron and Tibshirana, 1993, pp. 225–6):

1 Calculate the observed *t*-value : $t_{obs}(CAR_i) = \dfrac{\overline{CAR}_i - 0}{\sigma_i/\sqrt{n}}$ for portfolio *i*

where $\overline{CAR}_i$ is sample mean of *CAR* for portfolio *i*, σ_i is sample standard deviation of *CAR* for portfolio *i* and *n* is the number of firms in portfolio *i*.

2 Calculate $z_{ji} = CAR_{ji} - \frac{1}{n}\sum_j CAR_{ji}$ for portfolio *i* with $j = 1,\ldots, n$ (individual firms).

3 Generate resampled data $z_{1i}^*, \ldots, z_{ni}^*$ with a replacement sample from the original dataset $z_{1i}, \ldots, z_{ni}$: each of the *n* firms in a portfolio can be drawn (more than once) from the original portfolio. The size of the bootstrap sample is the same as the original portfolio size (*n* firms in a portfolio).

4 Calculate the bootstrapped *t*-value for the resampled dataset: $t_{boot}(z_i^*) = \dfrac{\overline{z_i^*}}{\sigma_i^*/\sqrt{n}}$ where $\overline{z_i^*}$ = sample mean of z_i^* for bootstrap portfolio *i* and σ_i^* = sample standard deviation of z_i^* for bootstrap portfolio *i*.

5 Repeat step 3 and 4 1000 times.

6 Count the number of times (*L*) that the bootstrapped *t*-value is more extreme than the original *t*-value. The resampling-based *p*-value or achieved significance level *ASL* is equal to *L*/1000:

$$ASL_{boot} = \#(t_{boot}(z^*) \quad t_{obs}(CAR))/1000 \tag{6}$$

Westfall and Young (1993, pp. 38–9) and Efron and Tibshirana (1993, p. 227) discuss the appealing properties of this bootstrap procedure. It does not rely on a theoretical *t*-distribution to obtain a *p*-value, so that the need for table look-ups is eliminated. The bootstrap test, when properly constructed, also outperforms the traditional *t*-test when the underlying distribution is nonnormal.

Second, we will test the difference between the two most extreme portfolios (portfolio 1 and 5) with the same bootstrap procedure as described above (i.e. the two-sample problem). Step 2 should be rewritten as follows:

$$z_{j1} = CAR_{j1} - \frac{1}{n_1}\sum_j^{n_1} CAR_{j1} + \frac{1}{n_l + n_5}\left[\sum_j^{n_1} CAR_{j1} + \sum_j^{n_5} CAR_{j5}\right] \tag{7}$$

and

$$g_{j5} = CAR_{j5} - \frac{1}{n_5}\sum_j^{n_5} CAR_{j1} + \frac{1}{n_1 + n_5}\left[\sum_j^{n_l} CAR_{j1} + \sum_j^{n_5} CAR_{j5}\right] \tag{8}$$

The bootstrapped *t*-value in step 4 can be reformulated as follows:

$$t_{boot}(z_1^* - g_5^*) = \frac{z_1^* - g_5^*}{\sqrt{\sigma_1^{2*}/n_1 + \sigma_5^{2*}/n_5}} \tag{9}$$

Thirdly, we will examine firm size as a possible explanatory element for the magnitude of the *CAR*. Foster *et al.* (1984) show that the smaller (bigger) the firm size, the bigger (smaller) the cumulative abnormal return. Therefore, the portfolios will be split into two subportfolios: large and small firms. Firm size is measured by the natural log of the market value of a stock. The same hypothesis tests (bootstrap *t*-test) as described above are applied to these subportfolios.

Finally, the power of firm size and standardized unexpected earnings in explaining the sign and magnitude of the *CAR* will be considered. This will be done by running the following panel regression,[6] allowing for fixed period effects (i.e. a dummy represents each of the five announcement periods in the sample):

$$CAR_j = \alpha_{period} + \beta_1 \cdot FS_j + \beta_2 \cdot SUE_j + \varepsilon_j \tag{10}$$

where CAR_j is the CAR of the jth firm (based on market model or size adjusted model), SUE_j is the estimated unexpected earnings of the jth firm, FS_j is log of market value at the of each year of the jth firm, α_{period} is intercept indicating a fixed announcement period effect and ε_j is disturbance term.

RESULTS AND INTERPRETATIONS

Table 2 reports some descriptive statistics on the variables used in the study: the *SUE*s and the *CAR*s. When the market model is used to generate unexpected returns, some outliers are detected by looking at the minimum and maximum column. This results in more extreme portfolio *CAR*s. Therefore we deleted these outliers in the final test procedures. Outliers appear to be a less severe problem in the size-adjusted return model. We will discuss the results reported in Tables 3, 4 and 6 for each of the two models used to estimate daily expected returns.

Cumulative abnormal returns based on the market model

The market model in Table 3 does not show a pattern consistent with the drift hypothesis assuming that the sign and size of the CAR is associated with the sign and size of unexpected earnings: large negative (resp. positive) unexpected earnings lead to large negative (resp. positive) cumulative abnormal returns. Both portfolios have negative *CAR*s (e.g. for the [+1, +90] period the *CAR*s is –0.1676 for Port. 1 and –0.3197 for Port. 5), where the *CAR* of Port. 5 is always more negative and more significant. However the differences between the *CAR*s of Port. 1 and Port. 5 are never significantly different from zero, meaning that the investment strategy consisting of a long position in stocks with unexpected earnings in the highest quintile, combined with a short position in stocks in the lowest quintile is not profitable. The *CAR*s in the pre-announcement period exhibit the same pattern as in the post-announcement period with no clear announcement day effect, which would be expected of a release of valuable information in an efficient market (no jump of the *CAR*s on the event date in Figure 1). A possible explanation could be the poor accuracy of the event dates. This is not applicable here, because we had the exact hour of each announcement at our disposal. Another market efficient explanation could be found in our portfolio assignment that is based on *SUE*s. A wrong earnings expectation model can lead to the assignment of good and bad news firms in the same portfolio. Because of the recent introduction of semi-annual earnings disclosure long consistent time series are not available and therefore more accurate forecast models could not be applied

The distinction between large and small firms in Table 4 does not result in more significant post-earnings announcement drifts. Moreover, after controlling for size we do not find that smaller (bigger) firms have bigger (smaller)

Table 2 Descriptive statistics of the variables

	Market model				*Size-adjusted returns model*			
	Mean	*Std.dev.*	*Minimum*	*Maximum*	*Mean*	*Std.dev.*	*Minimum*	*Maximum*
1st semester 1991								
[–60,–2]	–0.0118	0.5746	–1.7797	0.4998	0.0020	0.0927	–0.1391	0.3150
[–1,+1]	–0.3930	0.0299	–0.0848	0.0540	0.0021	0.0243	–0.0466	0.0873
[+1,+5]	–0.0276	0.0493	–0.1414	0.1058	0.0013	0.0455	–0.1726	0.0776
[+1,+30]	–0.1391	0.2532	–0.7073	0.3868	0.0052	0.0763	–0.2335	0.1376
[+1,+60]	–0.2957	0.5122	–1.4844	0.7977	–0.0168	0.1056	–0.3876	0.1760
[+1,+90]	–0.3912	0.7913	–2.2056	1.2801	–0.0065	0.1238	–0.4274	0.1654
SUE	–5.7953	18.2719	–42.4300	60.2400				
2nd semester 1991								
[–60,–2]	–0.2138	0.5344	–1.3851	0.9287	0.0011	0.0810	–0.1445	0.2255
[–1,+1]	–0.01102	0.0298	–0.0749	0.0605	0.0014	0.0171	–0.0508	0.0313
[+1,+5]	–0.0185	0.0386	–0.1323	0.0424	0.0035	0.0299	–0.0835	0.0596
[+1,+30]	–0.1103	0.2828	–0.7997	0.4655	0.0090	0.0556	–0.1405	0.1009
[+1,+60]	–0.1964	0.5293	–1.3652	1.0984	0.0069	0.0504	–0.0973	0.1051
[+1,+90]	–0.2337	0.7748	–1.8942	1.6649	0.0223	0.0666	–0.0929	0.1463
SUE	–0.6157	6.7028	–11.1199	29.1900				
1st semester 1992								
[–60,–2]	–0.1112	0.4845	–1.1094	1.1679	–0.0025	0.0889	–0.1797	0.1801
[–1,+1]	0.0092	0.0501	–0.0700	0.1702	0.0118	0.0344	–0.0681	0.0867
[+1,+5]	–0.0092	0.0646	–0.1380	0.1070	0.0024	0.0433	–0.0997	0.0761
[+1,+30]	–0.0620	0.2503	–0.6207	0.4367	0.0032	0.0673	–0.1802	0.1034
[+1,+60]	–0.1585	0.4630	–1.4140	0.7031	0.0006	0.0881	–0.2941	0.1585
[+1,+90]	–0.1872	0.7584	–1.9794	1.6111	0.0034	0.1033	–0.3332	0.1829
SUE	–2.4737	10.6019	–51.0999	12.7100				

2nd semester 1992								
[–60,–2]	–0.0615	0.5146	–1.2673	1.3924	0.0063	0.0883	–0.2616	0.2123
[–1,+1]	–0.0083	0.0326	–0.0669	0.0603	–0.0016	0.0243	–0.0379	0.0493
[+1,+5]	–0.0024	0.0614	–0.1183	0.1604	0.0074	0.0392	–0.0573	0.0914
[+1,+30]	–0.0503	0.2239	–0.6097	0.6468	–0.0044	0.0734	–0.1253	0.1389
[+1,+60]	–0.0823	0.4271	–1.0956	1.2088	0.0111	0.0866	–0.1322	0.2032
[+1,+90]	–0.1004	0.6093	–1.4097	1.6983	0.0082	0.1077	–0.2008	0.2099
SUE	0.1743	11.2759	–40.9099	35.0200				
1st semester 1993								
[–60,–2]	–0.0317	0.4209	–0.7943	0.9092	0.0047	0.0640	–0.1853	0.1288
[–1,+1]	0.0047	0.0338	–0.0492	0.1313	0.0045	0.0239	–0.0594	0.0703
[+1,+5]	0.0085	0.0516	–0.0766	0.1812	0.0079	0.0303	–0.0784	0.0958
[+1,+30]	–0.0013	0.2193	–0.3409	0.5998	0.0125	0.0398	–0.0446	0.1154
[+1,+60]	–0.0057	0.4262	–0.7281	1.0356	0.0105	0.0547	–0.0832	0.1016
[+1,+90]	0.0064	0.6426	–1.1739	1.6214	0.0024	0.0836	–0.1231	0.3140
SUE	8.6593	48.2971	–31.6299	256.5700				

with:
[–60,–2]: the cumulated abnormal returns for the period of 60 days before until 2 days before the day of the earnings announcement
[–1,+1]: the cumulated abnormal returns of the day before, the day of and the day after the earnings announcement
[+1,+5]: the abnormal returns are cumulated for 5 days after the day of the earnings announcement
[+1,+30]: the abnormal returns are cumulated for 30 days after the day of the earnings announcement
[+1,+60]: the abnormal returns are cumulated for 60 days after the day of the earnings announcement
[+1,+90]: the abnormal returns are cumulated for 90 days after the day of the earnings announcement
SUE = standardized unexpected earnings

Table 3 Results of *CAR*-indices for the unexpected earnings portfolios

	[–60,–2]	[–1,+1]	[+1,+5]	[+1,+30]	[+1,+60]	[+1,+90]
Market model						
Port. 1	–0.1162	–0.0074	–0.0116	–0.0627*	–0.1421**	–0.1676
Port. 2	–0.0594	–0.0054	0.0010	–0.0378	–0.0700	–0.0966
Port. 3	–0.1251*	0.0020	–0.0054	–0.0427	–0.0924	–0.0967
Port. 4	–0.1859***	–0.0018	–0.0103	–0.0895***	–0.1713***	–0.2316***
Port. 5	–0.3349***	–0.0049	–0.0239**	–0.1332***	–0.2400***	–0.3197***
Difference	–0.2187	0.0025	–0.0123	–0.0705	–0.0979	–0.1521
Size-adjusted returns model						
Port. 1	0.0063	0.0008	0.0010	0.0184	–0.0117	0.0006
Port. 2	0.0213	–0.0007	0.0117*	0.0176*	0.0242	0.0250
Port. 3	0.0066	0.0050*	0.0052	0.0085	–0.0001	–0.0049
Port. 4	–0.0033	0.0077**	0.0082**	0.0065	0.0071	0.0153
Port. 5	–0.0213	0.0053	–0.0046	–0.0273**	–0.0083	–0.0077
Difference	–0.0150	0.0045	–0.0056	–0.0457**	0.0037	–0.0083

with:
[–60,–2]: the cumulated abnormal returns for the period of 60 days before until 2 days before the day of the earnings announcement
[–1,+1]: the cumulated abnormal returns of the day before, the day of and the day after the earnings announcement
[+1,+5]: the abnormal returns are cumulated for 5 days after the day of the earnings announcement
[+1,+30]: the abnormal returns are cumulated for 30 days after the day of the earnings announcement
[+1,+60]: the abnormal returns are cumulated for 60 days after the day of the earnings announcement
[+1,+90]: the abnormal returns are cumulated for 90 days after the day of the earnings announcement
* = significantly different from zero at 10% level (Equation 6)
** = significantly different from zero at 5% level (Equation 6)
*** = significantly different from zero at 5% level (Equation 6)
Port. 1: portfolio 1 with most negative standardized unexpected earnings
Port. 5: portfolio 5 with most positive standardized unexpected earnings
Difference: difference between portfolio 1 and portfolio 5

cumulative abnormal returns. As mentioned above, the sample contains a large enough variation in firm size, and thus this is no valid explanation for our findings.

The size of the *CARs* are extremely high (e.g. –0.3197 for Port. 5 in the [+1, +90] period) which could be caused by the use of the market model to calculate expected returns. Since the CARs are especially high when there is an adjustment for market risk (market model) and not for firm size (size-adjusted returns model, cfr. part 6), the likelihood increases that these are risk

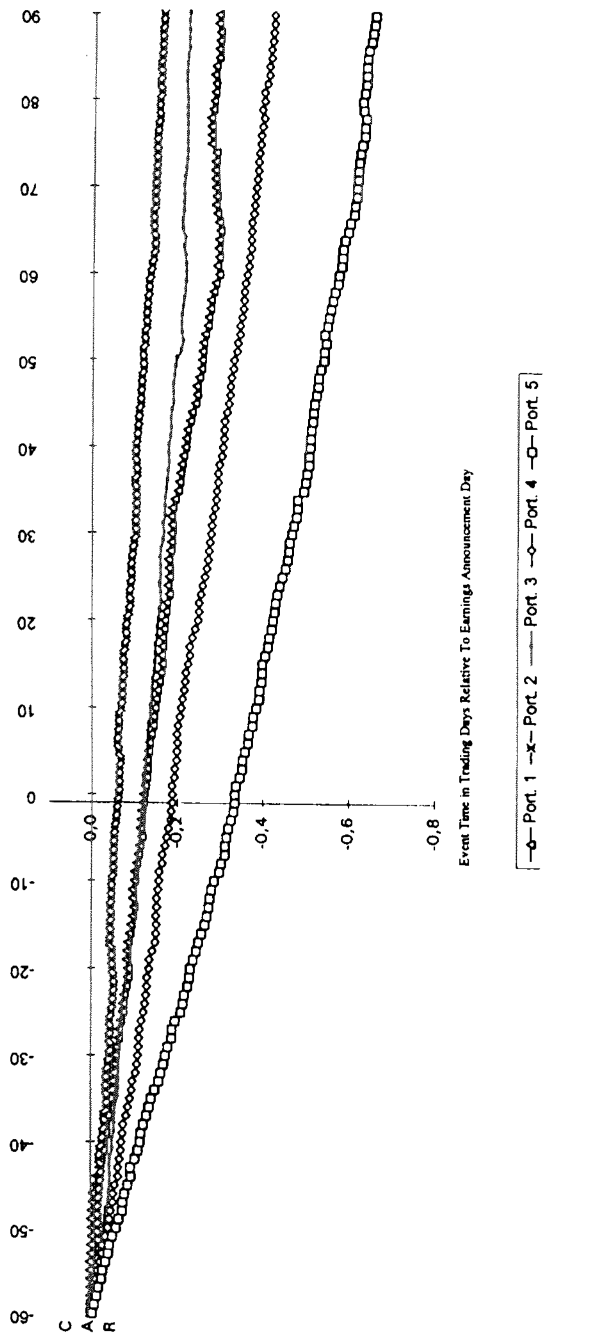

Figure 1 Behaviour of *CAR*s over [−60,+90] trading day period using market model

Table 4 *CAR* results for unexpected earnings portfolios: breakdown into small firm and large firms

Market model

	[−60,−2] *L*	[−60,−2] *S*	[−1,+1] *L*	[−1,+1] *S*	[+1,+5] *L*	[+1,+5] *S*
Port. 1	−0.0807	−0.1606	−0.0114	−0.0024	−0.0140	−0.0049
Port. 2	0.1339	−0.2073	−0.0002	−0.0094	0.0077	−0.0040
Port. 3	−0.1332**	−0.1041	−0.0007	0.0067	−0.0183***	0.0170
Port. 4	−0.1473**	−0.2296**	0.0009	−0.0049	−0.0024	−0.0194*
Port. 5	−0.3509***	−0.3190**	−0.0106	−0.0010	−0.0093	−0.0340*
Difference	−0.2702*	−0.1584	0.0008	0.0014	0.0047	−0.0291

	[+1,+30] *L*	[+1,+30] *S*	[+1,+60] *L*	[+1,+60] *S*	[+1,+90] *L*	[+1,+90] *S*
Port. 1	−0.0670	−0.0575	−0.1619*	−0.1848	−0.1338	−0.2098
Port. 2	0.0315	−0.0908	0.0673	−0.1746	0.0985	−0.2458
Port. 3	−0.0694**	0.0035	−0.1300**	−0.0275	−0.1486**	−0.0070
Port. 4	−0.0565	−0.1272**	−0.1169	−0.2334**	−0.1571	−0.3167**
Port. 5	−0.1513***	−0.1208*	−0.3128***	−0.1896	−0.4566***	−0.2255
Difference	−0.0843	−0.0633	−0.1509	−0.0048	−0.3228	−0.0157

Size-adjusted returns model

	[−60,−2] *L*	[−60,−2] *S*	[−1,+1] *L*	[−1,+1] *S*	[+1,+5] *L*	[+1,+5] *S*
Port. 1	−0.0154	0.0334*	−0.0042	0.0071	−0.0072	0.0112
Port. 2	0.0316*	0.0135	−0.0032	0.0012	0.0020	0.0190
Port. 3	0.0185	−0.0140	0.0048	0.0052	−0.0034	0.0199**
Port. 4	−0.0111	0.0057	0.0068	0.0088	0.0073*	0.0091
Port. 5	0.0151	−0.0463***	0.0039	0.0062	0.0140*	−0.0174
Difference	0.0305	−0.0797***	0.0081	−0.0009	0.0212*	−0.0286*

	[+1,+30] *L*	[+1,+30] *S*	[+1,+60] *L*	[+1,+60] *S*	[+1,+90] *L*	[+1,+90] *S*
Port. 1	−0.0022	0.0443***	−0.0359**	0.0186	−0.0431*	0.0552**
Port. 2	0.0026	0.0290**	0.0027	0.0407**	0.0015	0.0429**
Port. 3	0.0021	0.0194	−0.0143	0.0246	−0.0183	0.0184
Port. 4	−0.0006	0.0146	−0.0160	0.0335**	−0.0112	0.0456**
Port. 5	0.0051	−0.0496**	0.0221	−0.0309	0.0318*	−0.0348
Difference	0.0073	−0.0939***	0.0580**	−0.0497*	0.0748**	−0.0900**

with:

[-60,-2]: the cumulated abnormal returns for the period of 60 days before until 2 days before the day of the earnings announcement

[-1,+1]: the cumulated abnormal returns of the day before, the day of and the day after the earnings announcement

[+1,+5]: the abnormal returns are cumulated for 5 days after the day of the earnings announcement

[+1,+30]: the abnormal returns are cumulated for 30 days after the day of the earnings announcement

[+1,+60]: the abnormal returns are cumulated for 60 days after the day of the earnings announcement

[+1,+90]: the abnormal returns are cumulated for 90 days after the day of the earnings announcement

L = large firms

S = small firms

* = significantly different from zero at 10% level (Equation 6)

** = significantly different from zero at 5% level (Equation 6)

*** = significantly different from zero at 5% level (Equation 6)

Port. 1: portfolio 1 with most negative standardized unexpected earnings

Port. 5: portfolio 5 with most positive standardized unexpected earnings

Difference: difference between portfolio 1 and portfolio 5

premia not priced by the market model, but consequently priced by the market. Fama and French (1992, 1993) found that the beta coefficient has no explanatory power for the expected return. Other variables[7] seem to be important, such as firm size and book-to-market ratio. Another possible market efficiency explanation could be the biased estimators of the market model, caused by thin trading, use of an incorrect stockmarket index.[8] We used a correct stockmarket index, namely an equally weighted market return based on all stocks in BSE. Despite our sample consisting of the most traded companies thin trading could still affect the *CAR*s.

Part of the size of the *CAR*s could be explained by transaction costs and information costs.[9] Table 5 gives a summary of the transaction costs on the BSE. However, the small *CAR*s in the size-adjusted returns model (cfr.) are affected in the same way by these costs. Thus, it is less plausible that these costs are the reason of these high *CAR*s in the market model.

The same finding emerges from the results of the regression analysis (see Table 6). The variable firm size and the variable *SUE* never have the ability to explain the cumulative abnormal returns. The coefficient of firm size exhibits the expected negative sign: the bigger (resp. smaller) the firm size, the more negative (resp. positive) the magnitude of the *CAR*.

Cumulative abnormal returns based on the size-adjusted returns model

The portfolio *CAR*s in Figure 2 show the same relative pattern as in the market model: the *CAR* of Port. 5 is lowest and the *CAR* of Port. 2 is highest. Again, this rejects the classical assumed relation between *CAR* and the rank

Table 5 Transaction costs of stocks on the Brussels Stock Exchange

Amount of transaction (BEF)	*Broker's Commission* *Basis %*	*Fixed amount*	*Supplementary Costs* *Broker %*	*Customer %*	*Tax %*
< 2 million	1	100	0.04	0.025	0.14
2–5 million	0.90	100	0.04	0.025	or
5–10 million	0.80	100	0.04	0.025	0.35
> 10 million	0.60	100	0.04	0.025	

Source: Het Beleggingsboekje 1993–1994 (Kluwer Editorial)

Table 6 Regression panel (one-way error component: controlling for announcement period effect) statistics for CAR_j as dependent variable and firm size and unexpected earnings portfolio as independent variables

		Market model	
	b_1	b_2	R^2
[+1,+5]	–0.0025	–0.0002	0.0087
[+1,+30]	–0.0021	0.0005	0.0027
[+1,+60]	–0.0093	0.0013	0.0051
[+1,+90]	–0.0079	0.0017	0.0033
		Size-adjusted returns model	
	b_1	b_2	R^2
[+1,+5]	–0.0029	–0.0004**	0.0492
[+1,+30]	–0.0009	–0.0005**	0.0345
[+1,+60]	–0.0093*	–0.0005*	0.0379
[+1,+90]	–0.0105	–0.0004	0.0229

with:

Panel regression equation $CAR_j = \alpha_{period} + b_1 FS_j + b_2 SUE_j$ where FS_j firm size of firm j (logarithm of the market value), SUE_j unexpected earnings of firm j, e_j residual of firm j.

[+1,+5]: the abnormal returns are cumulated for 5 days after the day of the earnings announcement

[+1,+30]: the abnormal returns are cumulated for 30 days after the day of the earnings announcement

[+1,+60]: the abnormal returns are cumulated for 60 days after the day of the earnings announcement

[+1,+90]: the abnormal returns are cumulated for 90 days after the day of the earnings announcement

* = significantly different from zero at 10% level

** = significantly different from zero at 5% level

*** = significantly different from zero at 1% level

number of the *SUE*. No systematic significant *PAD* appears in Table 3 (only a significant *CAR* at 5% level for period [+1, +30] in Port. 5 and for period [+1, +5] in Port. 4). When size is introduced in Table 4 to differentiate between small and large firms the *CAR* pattern of the large firms is more consistent with the drift hypothesis: Port. 1 has the lowest *CAR* (–0.0072 for period [+1, +5], –0.0022 for period [+1, +30], –0.0359 (significant at 5%

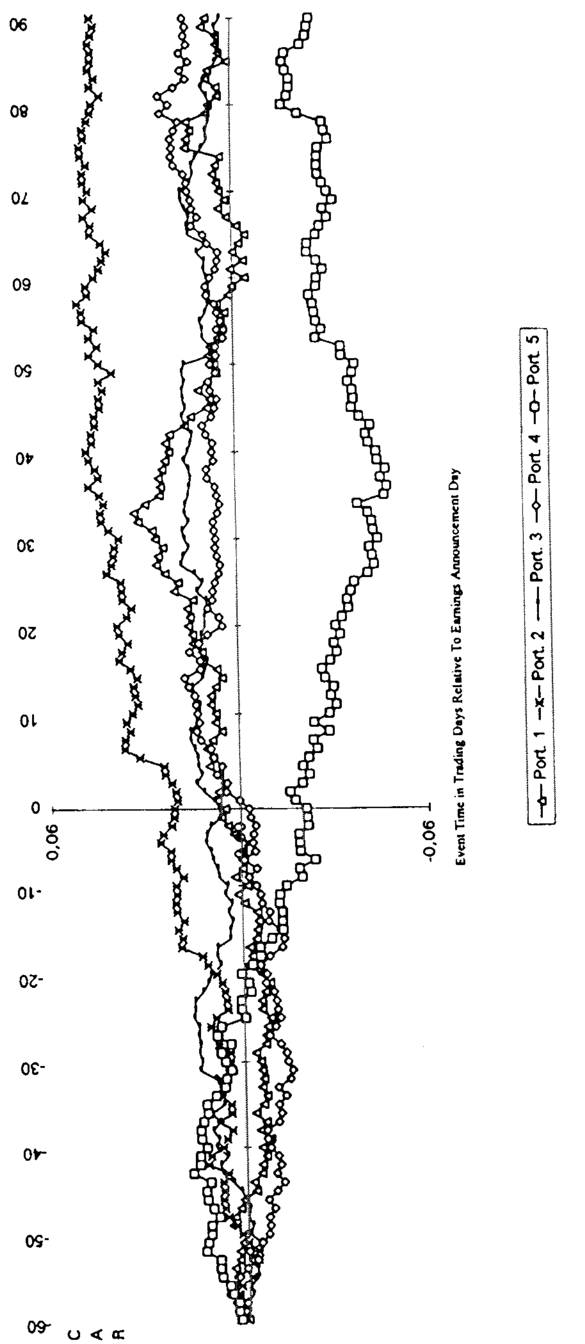

Figure 2 Behaviour of *CARs* over [−60,+90] trading day period using size-adjusted returns model

level) for period [+1, +60], and −0.0431 (significant at 10% level) for period [+1, +90]) and Port. 5 has the highest *CAR*, which is always positive (0.0140 for period [+1, +5] (significant at 10% level), 0.0051 for period [+1, +30], 0.0221 for period [+1, +60], and 0.0318 (significant at 10% level) for period +1, +90]). The differences between the *CARs* of Port. 1 and Port. 5 in the post-announcement period are almost always significant for the large and small firms, but the sign of the differences are opposite for both size categories: the investment strategy as explained in the previous parts gives 7.48% on 90 days for the large firms and −9% for the small firms. Indeed, the *CARs* of the small firms follow a more puzzling pattern, where Port. 1 has the highest positive *CARs* and Port. 5 the lowest. The regression results in Table 6 confirm the important role of firm size in explaining the *CARs*.

A plausible explanation for the contradictory *CAR* pattern for small and large firms can be found in the measure used to form the portfolios, i.e. *SUE*. The naive earnings expectation model (cfr. Equation 2) is not accurate for small firms, and thus the *SUE* is no indication of bad and good news. More specifically we found that the standard deviation of the *SUEs* is much higher for small firms than for large firms (33.175 versus 5.993). Large firms have a more stable earnings process[10] and can be assigned more easily to the 'right' news category based on *SUE*.

SUMMARY AND CONCLUSION

This study examines the existence of a post-earnings announcements drift after the semi-annual earnings announcement on a small capital market (e.g. Brussels Stock Exchange). The analysis is conducted for the period 1991–93. An earnings based expectation model is used to forecast unexpected earnings, while the market model and the size-adjusted returns model are applied to estimate expected returns.

A systematic post-earnings announcement drift is found neither for the market model nor for the size-adjusted returns model. An investment strategy (long position in the portfolio of the 20% most positive unexpected earnings and a short position in the portfolio of the 20% most negative unexpected earnings) based on *SUE* seems to be never profitable. The results suggest that the market model is not a descriptively valid pricing model for the Brussels Stock exchange or that its parameters are misspecified.

For the size-adjusted returns model we originally found a similar *CAR* pattern as in the market model, but when we distinguish between large and small firms we discover a *CAR* pattern for the large firms consistent with the results reported in the literature, i.e. low (high) *SUE* portfolios lead to negative (positive) *CARs*. However, the small firms show a puzzling pattern. These findings are probably due to the portfolio assignment: large firms have a more stable earnings process and can be assigned more easily to the 'right' news category based on *SUE*.

Further research in an international context should explore the validity of the market model for other small EU-markets. It should also give an answer to the question whether the Belgian evidence can be generalized for the other small capital markets (Denmark, Austria, Spain, etc.). Financial analyst's earnings forecasts could be used as a proxy for market earnings expectation instead of a naive earnings based model and could be compared with our findings.

NOTES

First draft presented at the EIASM workshop on 'Empirical Research on Corporate Financial Communication and the Stock Market' (Brussels, 26 January 1995).

1 There are several possible accounting-based anomalies which could explain the *PAD*; Bernard *et al.* (1995) examine six anomalies (based on 6 different portfolio strategies to earn abnormal returns): standardized unexpected earnings effect, announcement quarter returns effect, the Ou-Penman anomaly, the Holthausen-Larcker Pr anomaly, the book-to-market anomaly, and the price-earnings anomaly. They find evidence that the first anomaly which is based on *SUEs* is most consistent with market inefficiency.

2 Bernard and Thomas (1990) indicate that this scale factor yields similar amounts of price drift as the factor based on the historical standard deviation of earnings. The latter approach requires longer time-series, which are not available in the current study.

3 Define the true price as the price at which, aside from transaction costs, a stock can be bought and sold as a reaction on the earnings release. The closing price is the price at which the last transaction occurred prior to the closing of the stock market. A 'bid' price occurs if, for example, the last transaction presents a sell order which cannot be matched with a corresponding buy order. Note that such a bid price is probably less than the true price. Similarly, a buy order that cannot be matched with a sell order will result in an ask price (probably greater than the true price).

4 These estimations are provided by the Generale Bank (Brussels).

5 Several authors documented that the last day of December and the first days of January are the days on which securities have the highest returns of the year.

6 Panel data refers to data where the unit of observation varies in two dimensions: different firms and different time-periods (announcement periods).

7 Fama and French identify five common risk factors on stocks and bonds. There are three stock-market factors: an overall market factor and factors related to firm size and book-to-market equity. There are two bond-market factors, related to maturity and default risks. Stock returns have shared variation due to the stock-market factors and they are linked to bond returns through shared variation in the bond-market factors. These five factors seem to explain average returns on stocks and bonds. We refer to Fama and French (1992, 1993) for a extensive discussion.

8 A misspecification can appear if a stockmarket index is used as proxy for the market return (Ball 1992, pp. 326–7). Most stockmarket indices exclude small firms and are therefore dominated by the large equities. This is certainly the case when these indices are weighted by stockmarket capitalization. In general, the use of a stockmarket index as proxy for the market return leads to a more effective use of the market return in an asset pricing model for large equities

than for small ones. Ward (1993) gives a discussion about the criteria that should be used in selecting or constructing indices. Bartholdy and Riding (1994, p. 244) stress the importance of the market index to the estimation of the beta.

9 Ball (1992) assumes that the investors will not try to understand the full implication of current earnings for future earnings if it is too expensive to do so. Instead, investors will wait for future earnings to be announced in order to adjust the prices. But he concludes that it is difficult to distinguish between information costs and market inefficiency as explanation for the *PAD*. The reason for this is the fact that this choice depends on whether the definition of efficiency allows for information acquisition and processing costs.

10 In the literature it is called 'income smoothing'. We refer to Dechow (1994) and Bitner and Dalon (1996) for an extended discussion.

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